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09/585,217	06/01/2000	Alexander C. Vlachos	0100.0000350	4894

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EXAMINER
SEALEY, LANCE W

ART UNIT	PAPER NUMBER
2671	4

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/585,217	VLACHOS ET AL.
	Examiner	Art Unit
	Lance W. Sealey	2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 June 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Allowed and Allowable Subject Matter

1. Claims 4, 14 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims because no prior art anticipates or suggests re-normalizing the component vertex normal vector included in the component vertex parameters for each of the component vertices.

Claim Rejections - 35 USC § 102

2. The following is a quotation of 35 U.S.C. 102(b) which forms the basis for all novelty rejections set forth in this Office action:

> A person shall be entitled to a patent unless—
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2, 5-9, 20, 22 and 24-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Luken (U.S. Pat. No. 5,727,220).

4. Luken, in disclosing a method and apparatus for rendering polygons, also discloses, with respect to claim 1, a method for video graphics processing, comprising:

- receiving primitive vertex parameters corresponding to vertices of a video graphics primitive, wherein the primitive vertex parameters for each vertex include a primitive vertex set of three-dimensional coordinates and a primitive vertex normal vector

(Luken's Background of the Invention states that polygons are defined by a sequence of vertex data records (applicants' "vertex parameters") including vertex coordinates and vertex normal vectors; see col.1, ll.19-22. Since the Background of the Invention also states that polygons are widely used in 3-D graphics (col.1, l.13) and Luken's local memory **204** stores 3-D coordinates, it is inherent that the vertex coordinates referred to in col.1, l.20 of Luken would be three-dimensional coordinates. The existence of video refresh **116** in FIG.1 suggests that Luken deals with video graphics primitives.);

- tessellating the video graphics primitive to produce a plurality of component primitives, wherein each component primitive of the plurality of the component primitives is defined by component vertices having corresponding component vertex parameters, wherein component vertex parameters for each component vertex parameters for each component vertex include a component vertex set of three-dimensional coordinates and a component vertex normal vector, wherein the component vertex parameters for each component vertex are derived from at least a portion of the primitive vertex parameters (See FIG.3A and col.8, ll.22-62 for tessellation of the video graphics primitive. Col.8, ll.60-66 disclose calculating vertex normal vectors ("lighting") for the new vertices created as a result of the tessellation.); and
- for each component primitive of the plurality of component primitives, processing the component primitive using a three-dimensional processing pipeline (FIG.1), wherein

processing generates pixel data corresponding to the component primitive (pipeline shown in FIG.1; pixel data generated by graphics display processor **106**; see col.6, ll.44-46).

5. The rest of the claims in this rejection will now be considered. With respect to claims 2 and 22, Luken discloses calculating the component vertex parameters for each of the component vertices using Nth order interpolation, N an integer greater than one, at col.8, ll.22-62, especially ll.60-62.

6. Concerning claims 5 and 24, Luken discloses the inclusion of adding lighting effects to the pixel data based on the component vertex normals for the vertices for the component primitives as a part of processing the component primitive at the fourth sentence of the Abstract.

7. Regarding claims 6-8 and 25, Luken discloses adding specular (claims 6 and 25), diffuse (claim 7) and environmental mapping lighting effects (claim 8: col.1, ll.19-33 and col.2, ll.20-26 state that such effects are known in the prior art; Luken's ambient lighting is equivalent to the applicants' environmental mapping lighting).

8. With respect to claims 9 and 26, Luken discloses adding lighting effects as comprising calculating vertex lighting effects at each of the component vertices of the component primitive (col.2, ll.20-35) and calculating lighting effects for each pixel location in the component primitive by linearly interpolating the vertex lighting effects for at least a portion of the component vertices of the component primitive (known in prior art in Gouraud shading, col.2,

l.57-col.3, l.2).

9. Finally, with respect to claim 20, Luken discloses a method for video graphics processing, comprising:

- receiving vertex parameters corresponding to vertices of a video graphics primitive, wherein the vertex parameters for each vertex include three-dimensional coordinates and a normal vector (Luken's Background of the Invention states that polygons are defined by a sequence of vertex data records (applicants' "vertex parameters") including vertex coordinates and vertex normal vectors; see col.1, ll.19-22. Since the Background of the Invention also states that polygons are widely used in 3-D graphics (col.1, l.13) and Luken's local memory **204** stores 3-D coordinates, it is inherent that the vertex coordinates referred to in col.1, l.20 of Luken would be three-dimensional coordinates. The existence of video refresh **116** in FIG.1 suggests that Luken deals with video graphics primitives.);
- tessellating the video graphics primitive to produce a plurality of component primitives, wherein the plurality of component primitives are defined by a plurality of additional vertices and the vertices of the video graphics primitive (See FIG.3A and col.8, ll.22-62 for tessellation of the video graphics primitive); and
- calculating an additional normal vector for each additional vertex of the plurality of additional vertices (col.8, ll.60-66 disclose calculating vertex normal vectors ("lighting")

for the new vertices created as a result of the tessellation);

10. Therefore, in view of the foregoing, claims 1-2, 5-9, 20, 22 and 24-26 are rejected as being unpatentable under 35 U.S.C. 103 by Luken.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 3, 10, 23 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable by Luken in view of Gharachorloo et al. ("Gharachorloo", U.S. Pat. No. 5,488,684).

13. Luken does not disclose, with respect to claims 3 and 23, calculating the component vertex parameters for each of the component vertices using Nth order interpolation, wherein N is an integer greater than one, in the process of tessellating the video graphics primitive. However, this element is disclosed by the Gharachorloo method and apparatus for rendering trimmed parametric surfaces at col.8, ll.19-45: bilinear interpolation=second order interpolation.

14. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Gharachorloo interpolation method in the Luken method.

This would save time both in reducing the generation of tiny polygons and rendering the tiny polygons further down the pipeline (Gharachorloo, col.2, ll.19-22).

15. The rest of the claims in this rejection will now be considered. Concerning claims 10 and 27, Gharachorloo discloses tessellating based on a tessellation level, wherein the tessellation level determines a number of component primitives included in the plurality of component primitives (known in the prior art; col.1, l.65-col.2, l.12).

16. Therefore, in view of the foregoing, claims 3, 10, 23 and 27 are rejected as being unpatentable under 35 U.S.C. 103 by Luken in view of Gharachorloo.

17. Claims 4 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable by Luken in view of Owen, "Phong Shading Model for Scan-Line Graphics."

18. With respect to both claims, Luken does not disclose re-normalizing the component vertex normal vector included in the component vertex parameters for each of the component vertices. However, this is disclosed in the Owen reference as the second step of the Phong shading algorithm.

19. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate a step from the Phong shading algorithm, as described by Owen, in the Luken method. This would improve the accuracy of rendering shiny objects, or, as stated in Owen, provide "good specular highlights" (Owen, next to the last sentence).

20. Therefore, in view of the foregoing, claims 4 and 21 are rejected as being unpatentable

under 35 U.S.C. 103 by Luken in view of Owen.

21. Claims 11, 13, 15 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable by Luken in view of Akeley et al. ("Akeley," U.S. Pat. No. 5,854,631).

22. Concerning claim 11, Luken discloses a video graphics circuit comprising:

- a frame buffer that stores pixel data corresponding to image data for a frame (**114**, FIG.1); a central processor that generates processing commands and vertex parameters corresponding to video graphics primitives (host computer **102**, FIG.1, and col.6, ll.34-36);
- a control processor operably coupled to the central processor, wherein the control processor generates control information based on the processing commands (graphics control processor **106**, FIG.1. Communication to the graphics display processor **110** is disclosed in col.6, ll.42-43. Control information is the data passed to the graphics display processor **110** in col.6, ll.36-41);
- a tessellation block (function of graphics display processor **110**; see col.6, l.65-col.7, l.13) operably coupled to the central processor and the control processor, wherein the tessellation block receives a first portion of the control information from the control processor (see col.6, ll.36-41; any portion of the control information passed to the graphics display processor could arbitrarily be called the "first portion"), wherein, for each video graphics primitive, the tessellation block receives vertex parameters

corresponding to each of the vertices of the video graphics primitive (col.6, l.67-col.7, l.1) and tessellates the selected video graphics primitive (col.7, ll.2-5) based on tessellation information included in the first portion of the control information, wherein tessellation of the video graphics primitive produces component vertex parameters for a plurality of component primitives that correspond to the video graphics primitive (See FIG.3A and col.8, ll.22-62 for tessellation of the video graphics primitive. Col.8, ll.60-66 disclose calculating vertex normal vectors ("lighting") for the new vertices created as a result of the tessellation.);

- a lighting block operably coupled to the tessellation block and the control processor, wherein the lighting block receives component vertex parameters corresponding to each of the component primitives from the tessellation block and receives a second portion of the control information from the control processor, wherein the lighting block adds lighting effects to the component vertex parameters for each of the component primitives to produce modified vertex parameters, wherein the lighting effects are added based on at least a portion of the component vertex parameters and the second portion of the control information (function of graphics control processor **106**, FIG.1; see col.11, ll.16-23. Any portion of the control information passed to the graphics display processor, not passed by the tessellation block, could arbitrarily be called the "second portion"); and
- a three-dimensional video graphics pipeline operably coupled to the lighting block, the

control processor, and the frame buffer (FIG.1), wherein the three-dimensional video graphics pipeline receives the modified vertex parameters for each of the component primitives and processes each of the component primitives (col.8, ll.22-66).

23. However, Luken does not disclose generating pixel fragment data that is blended with the pixel data stored in the frame buffer. This element is disclosed by the Akeley system and method for merging pixel fragments based on depth range values at col.5, ll.24-27.

24. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Akeley merging method in the Luken method. This would save time over the already-effective A-buffer process of rendering antialiased objects in hidden surfaces because it eliminates the need to process long linked lists of fragments (Akeley, col.1, ll.27-35, 50-53, 65-67 and col.2, ll.15-16 and 25-26).

25. The rest of the claims in this rejection will now be considered. Regarding claim 13, Luken discloses the vertex parameters for each video graphics primitive and the component vertex parameters for each component primitive of the plurality of component primitives including, for each vertex, three-dimensional coordinates and a normal vector (col.8, ll.60-66 disclose calculating vertex normal vectors ("lighting") for new vertices created as a result of the tessellation).

26. With respect to claim 15, Luken discloses calculating the component vertex parameters for each of the component vertices using Nth order interpolation, N an integer greater than one, at

col.8, ll.22-62, especially ll.60-62.

27. Finally, regarding claims 17-19, Luken discloses adding specular (claim 17), diffuse (claim 18) and environmental mapping lighting effects (claim 19: col.1, ll.19-33 and col.2, ll.20-26 state that such effects are known in the prior art; Luken's ambient lighting is equivalent to the applicants' environmental mapping lighting).

28. Therefore, in view of the foregoing, claims 11, 13, 15 and 17-19 are rejected as being unpatentable under 35 U.S.C. 103 by Luken in view of Akeley.

29. Claims 12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable by Luken in view of Akeley and further in view of Gharachorloo.

30. Neither Luken nor Akeley disclose, with respect to claim 16, calculating the component vertex parameters for each of the component vertices using Nth order interpolation, wherein N is an integer greater than one, in the process of tessellating the video graphics primitive. However, this element is disclosed by the Gharachorloo method and apparatus for rendering trimmed parametric surfaces at col.8, ll.19-45: bilinear interpolation=second order interpolation.

31. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Gharachorloo interpolation method in the Luken-Akeley method. This would save time both in reducing the generation of tiny polygons and rendering the tiny polygons further down the pipeline (Gharachorloo, col.2, ll.19-22).

32. The other claim in this rejection will now be considered. Concerning claim 12, Gharachorloo discloses tessellating based on a tessellation level, wherein the tessellation level determines a number of component primitives included in the plurality of component primitives (known in the prior art; col.1, l.65-col.2, l.12).

33. Therefore, in view of the foregoing, claims 12 and 16 are rejected as being unpatentable under 35 U.S.C. 103 by Luken in view of Akeley and Gharachorloo.

34. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable by Luken in view of Akeley and further in view of Owen.

35. Neither Luken or Akeley disclose re-normalizing the component vertex normal vector included in the component vertex parameters for each of the component vertices. However, this is disclosed in the Owen reference as the second step of the Phong shading algorithm.

36. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate a step from the Phong shading algorithm, as described by Owen, in the Luken-Akeley method. This would improve the accuracy of rendering shiny objects, or, as stated in Owen, provide "good specular highlights" (Owen, next to the last sentence).

37. Therefore, in view of the foregoing, claim 14 is rejected as being unpatentable under 35 U.S.C. 103 by Luken in view of Akeley and further in view of Owen.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lance Sealey whose telephone number is (703) 305-0026. The examiner can normally be reached Monday-Friday from 7:00 am to 3:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached on (703) 305-9798. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700 or the Customer Service Office at (703) 306-0377.

Respectfully submitted,

Lance W. Sealey

Lance W. Sealey, examiner
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Washington, DC 20231